Autobiographical memory from a life span perspective

Schroots, J.J.F.; van Dijkum, C.; Assink, M.H.J.

published in
International Journal of Aging and Human Development
2004

DOI (link to publisher)
10.2190/7A1A-8HCE-0FD9-7CTX

document version
Publisher's PDF, also known as Version of record

INT'L. J. AGING AND HUMAN DEVELOPMENT, Vol 58(1) 69-85, 2004

AUTOBIOGRAPHICAL MEMORY FROM A LIFE SPAN PERSPECTIVE*

JOHANNES J. F. SCHROOTS
Free University Amsterdam

COR VAN DIJKUM
Utrecht University, The Netherlands

MARIAN H. J. ASSINK
Free University Amsterdam

ABSTRACT

This comparative study (i.e., three age groups, three measures) explores the distribution of retrospective and prospective autobiographical memory data across the lifespan, in particular the *bump* pattern of disproportionally higher recall of memories from the ages 10 to 30, as generally observed in older age groups, in conjunction with the well-known *recency* effect. The memory data patterns of the Life-line Interview Method (LIM, the measure of this study, were compared to the published data patterns of two other memory measures (i.e., the Time Line and Life event sorting task). The results of this comparative study confirm the universality of the bump for older adults, as well as the recency effect. From the LIM data patterns it is hypothesized that both bump and recency effects play a part not only in middle-aged and older adults but also in younger people. In search for an explanation of these patterns, a theoretical outline is presented for the study of autobiographical memory as a dynamic system of both retrospective and prospective memory, subject to continuous changes across the lifespan.

*Much of the work reported in this article was privately funded by ERGO (European Research Institute on Health and Aging).

The purpose of this article is to explore the distribution of autobiographical memory data across the lifespan. The history of the term *autobiographical memory* is characterized by a diversity of conceptions and definitions (Brewer, 1995); here, we broadly define autobiographical memory as a type of episodic memory for both retrospective and prospective information related to the self. The classical technique for studying retrospective autobiographical memory—the so-called *prompt word* technique—originated from Galton (1879) and was modified by Crovitz and Schiffman in 1974 (i.e., subjects are presented with a word and asked to think of a specific memory they associate with that word). Later researchers extended this cued-memory technique by sampling memories without restrictions on time of occurrence or kind of experience (Robinson & Taylor, 1998). For younger age groups, the resulting distribution of memories follows a power function similar to the classical forgetting or retention curve (Rubin & Schulkind, 1997). For older age groups, however, the distribution departs from a simple forgetting function and turns into a roughly bimodal distribution of memories with a concentration of memories from the recent past, the familiar *recency* effect, and another between 10 and 30 years of age, called the *bump* effect (Conway & Pleydell-Pearce, 2000; Rubin, 2002).

In contrast with (retrospective) autobiographical memory, it is only recently that some experimental researchers have shown interest in prospective memory (see Maylor, Darby, Logie, Della Sala, & Smith, 2002 for a review). According to these researchers, prospective memory can be defined "as remembering at some point in the future that something has to be done, without any prompting in the form of explicit instructions to recall" (p. 236). This definition, which emphasizes the memory function of *remembering to remember,* covers only partly prospective *autobiographical* memory functioning. If retrospective autobiographical memory relates to the retrieval of memories, experiences, or past events in the present, then prospective autobiographical memory is concerned with the retrieval of expectations, anticipations, or future events, which likewise are based on present memory functioning. The technique for studying prospective autobiographical memory has essentially its origins in the administration of a so-called time line (Rappaport, Enrich, & Wilson, 1985), on which the subject is requested to indicate significant life events for both past and future. As far as is known, deVries and Watt (1996) are the only researchers who studied the distribution of prospective autobiographical memory across the lifespan. From their data, it can be assumed that the distribution follows a power function by age group; that is, life events which are expected for the near future are indicated more frequently than events which are expected for the distant future. As such, the prospective memory function follows in all probability the classical retention curve, although the term retention is not really appropriate in the context of expectations, anticipations, or future events.

Given the above autobiographical memory distribution patterns, we are especially interested in the bump effect. Many interpretations have been proposed

regarding this complex, bimodal pattern, for which Rubin, Rahhal, and Poon (1998) have produced the following conclusive evidence:

> For older adults the period from 10 to 30 years of age produces recall of the most autobiographical memories, the most vivid memories, and the most important memories. It is the period from which peoples' favorite films, music, and books come and the period from which they judge the most important world events to have originated (p. 3).

In explaining the bump effect, Rubin and colleagues (1998) proposed four possible theoretical accounts from four different areas of psychology. The following summary, which has been liberally taken from their comprehensive literature review, provides an outline of the four arguments.

1. *Cognitive* account. Events from early adulthood are remembered best because they occur in a period of transitions from rapid change to stability. In times of rapid change many novel events are encountered, which benefit recall as follows. First, when a novel event is encountered at the end of a period of change, there is more effort after meaning, which increases the event's memorability. Second, there may be a lack of proactive interference, which is an important cause of forgetting, because the novel event is different from what has preceded it. Third, the first time that an event occurs, it should be more distinctive both because of its novelty and because more attention is paid to details that the individual will learn to ignore in later occurrences. Such distinctiveness is an aid to later memory. Rubin and colleagues also note the benefits of stability on later recall. First, events from stable periods are more likely to serve as prototypes or models for future occurrences and thus may be retrieved and rehearsed more as new events are retrospectively compared to them. Second, once a stable cognitive structure has been established, this structure will serve as a stable organization to cue events.

2. *Cognitive abilities/Neural substrate* account. If cognitive abilities were to rise and fall as a function of age with the same time course as that for the bump, this rise and fall could account for enhanced memory in early adulthood if one assumes that people learn in proportion to their ability. In contrast, if there was a rapid, major increase in abilities followed by a period of relative stability, or slow decline, then a more complex explanation would be needed. The latter pattern is the case both for cognitive processing speed and memory test data as for fluid intelligence. At the neural level, both patterns could exist, i.e., an aspect of neural development could either follow a course similar to the pattern of cognitive abilities, with a rapid rise and slow decline, or it could peak sharply in early adulthood.

3. *Identity formation* account. A sense of identity develops in late adolescence. If identity is viewed as a narrative of the important aspects of one's life, and if much of identity is formed in early adulthood, there will be more events in that narrative that come from early adulthood than would be expected from a monotonic forgetting function. In addition, events from this period will be more

likely to be organized and incorporated into an overall story or view of the self and thus benefit mnemonically from all the advantages of such a schematic organization as well as from increased spaced rehearsal.

4. *Genetic fitness* account. Early adulthood could be special because it is the time of the greatest potential to reproduce. That is, the increase in memory during the bump could serve the cognitive functions needed in selecting the best mate. In addition, it might not have been as common for our ancestors to live as long as we now do, so there might have been little selection pressure for a high level of functioning beyond a certain age.

Rubin et al. (1998) have made a fair attempt to account for the bump effect in both autobiographical and factual, semantic memory data. Unfortunately, the last three accounts (i.e., cognitive abilities/neural substrate, identity formation, genetic fitness) do not explain much; they just describe the bump phenomenon from three completely different theoretical perspectives. In contrast, the first theoretical account (i.e., cognitive) is based on five fundamental principles of cognitive psychology, which separately or in combination, may explain the bump, but by sheer number and varying combinations give the impression of *ad hoc* theorizing (cf. Ockham's razor). This impression is reinforced by the observation that the bump effect can only be demonstrated for middle-aged and older people, that is, for people over 40 years of age (deVries & Watt, 1996; Robinson & Taylor, 1998), while our intuitive conception of the autobiographical memory bump suggests some basic memory process over the entire lifespan. The latter seems plausible from the perspective that the autobiographical bump or increase in memories in younger adults could be overshadowed by memories for recent events (i.e., recency effect) (Fitzgerald, 1995). This viewpoint, then, asks for a different approach in theory formation, which is concentrated on the dynamics of the autobiographical memory system over the course of life.

In this article, we present an autobiographical memory study on young, middle-aged, and older adults in order to replicate and extend the evidence for various autobiographical memory effects across the lifespan and to explore a more dynamic approach in theory formation. The retrospective and prospective memory data for this study are collected with the help of the Life-line Interview Method (LIM), a special method for the eliciting of autobiographical information about important life-events for both past and future of the individual. In the following, we first present descriptive statistics of the LIM by age group. Next, we present graphically the empirical evidence by age group and decade. In order to support the evidence, we reproduce similar data from the deVries and Watt (1996) study on Rappaport's time line. To extend the evidence on the basis of different memory techniques, relevant data from the Fitzgerald (1995) study is reproduced graphically. To make comparisons among figures easier, we standardize the data sets according to the Rubin et al. (1998) procedure by converting the data reported in number of events per time period to percentages so that the area under all curves is the same 100%. Finally, we develop some

suggestions for a new theoretical account of the autobiographical memory distribution across the lifespan.

METHOD

Subjects

Ninety-eight subjects were interviewed with the LIM, 47 males and 51 females, drawn in almost equal numbers from three age groups: (a) early, (b) middle, and (c) late adulthood. The mean ages and age ranges for the three groups were 23.5 (18-30), 43.3 (31-55), and 67.3 (56-84) years, respectively. The subjects were Caucasians of primarily middle to higher socioeconomic status recruited initially from educational and health organizations in two Dutch metropolitan areas and then sampled by means of the snowball method.

Material

For the interview a blank piece of paper (A4 landscape format) was used, on which a grid was printed. The grid consisted of a bottom and top line (296 mm), connected by two solid and one dotted vertical line of equal length (180 mm) at 0 mm, 180 mm, and 296 mm from the origin, respectively.

Life-Line Interview Method

The LIM is part of the research program "Life-course Dynamics," which studies the dynamics of development and aging from a psychological perspective, or the subjective and objective organization of behavior over the course of life (Schroots, 1988, 2003; Schroots & Yates, 1999). With the term *subjective,* we mean the perception by the individual of his or her life, which implies some sort of memory for life events and experiences. As Lakoff and Johnson (1980) have demonstrated convincingly, metaphors are language tools *par excellence* for people to describe their life histories and expectations for the future. Metaphors allow us to map what we know onto what we vaguely know and give rise to new concepts and integration (Schroots, Birren, & Kenyon, 1991). Well-known metaphors of life are the *tree* (i.e., life as a branching tree), the *river* (i.e., the river of life), and the *life as a footpath* metaphor (Schroots, 1984; Schroots & ten Kate, 1989).

From the footpath metaphor to the LIM as autobiographical memory technique is only a small step as soon as one recognizes the forementioned mapping function of metaphors. Literally, the graphical, two-dimensional representation of a footpath with time on the horizontal dimension and affect on the vertical dimension—symbolizes the course of human life with its ups and downs of important life events. In a typical LIM session, then, the subject is asked, (a) to place perceptions of his or her life visually in a temporal framework by drawing a life-line for both past (i.e., from birth to calendar age) and future (i.e.,

from calendar age to expected death), and (b) to label each peak and each dip (i.e., life event), by chronological age and a brief description (see also Administration). Typical labels of peaks and dips are, "I married my sweetheart from high school after graduation at age 17," and "I lost my father when I was four years old," respectively. The result is a unique series of past and future life events, which reflect the subject's retrospective and prospective autobiographical memory at the event level (cf. Bluck & Habermas, 2001).

Time Line

The Rappaport Time Line (TL) is a methodologically simple measure developed by Rappaport et al. (1985) and slightly adapted by deVries and Watt (1996) for the purpose of studying age and gender variations of life events and life stories. For comparison, relevant data from the deVries and Watt study are reproduced in the next section. The following description is a brief summary of TL material, administration, and sample as reported in this study. deVries and Watt presented 60 individuals (10 men and 10 women, at each of three age groups (i.e., young, middle-aged, older adulthood) with a 12-inch line placed vertically on an 8.5 by 14-inch piece of plain white paper, anchored, and labeled at one end by *BIRTH* and at the other by *DEATH.* The mean ages and age ranges for the three groups were 21.2 (18-25), 41.9 (35-50), and 72.7 (65-86) years, respectively. The instructions requested individuals to consider this Line "as representing their entire lives, to place it horizontally in front of them, and to indicate their location on this Line at the present. They were then requested to place a mark and a label indicating significant life events of their past and present (...) on the Line. Participants were also asked to indicate their age at the time of event" (p. 85). It should be noted that the TL was part of a questionnaire which was individually completed in a single session of about 90 to 120 minutes. The final result was a series of significant life events, labeled by chronological age, for both past and future of the individual.

Fitzgerald Study

To extend the comparative evidence for bump and recency effects on the basis of a different memory technique, relevant data are reproduced from Fitzgerald (1995, p. 372), who asked 45 adults between the ages of 31 and 46 (median age 36), as well as 45 adults between the ages of 60 and 76 (median age 66) for four memories they would want included in a book about their lives. After they wrote the memories, they were asked their age at the time of the event and to describe the frequency with which they had discussed it. From a comparative point of view, it should be noted that in the Fitzgerald Study (FS) only retrospective autobiographical memory data were produced for two age groups (i.e., middle and late adulthood) and that, consequently, only retrospective data from two LIM- and TL-age groups can serve as material for comparison.

Administration

The interviewer (iter) introduced the general plan of the session by saying that he/she was interested in the human life course with its ups and downs, rises and declines, etc., which are all completely different from one person to another. Iter then explained that he/she would like to hear the life story of interviewee (itee) in a special way. After giving three examples of life-lines, from simple to complex, iter continued in asking itee to draw his/her life-line in the blank LIM grid from birth dot (i.e., middle of solid line, 0 mm) to his/her calendar age (i.e., solid line, 180 mm). As soon as the life-line had been drawn, itee was asked to label each peak and each dip by chronological age and to tell what happened at a certain moment or during an indicated period. At the same time, iter made a verbatim report of what itee saw as the most important events in his/her life. After the past life-line had been labeled and described in detail, the future was explored in the same manner. Starting from the age point where the past life-line had stopped, itee was asked to continue the line until the dotted age-line (296 mm) of expected death was reached. Then, the whole procedure of labeling the peaks and dips of the future life-line was repeated. Overall, the administration time of the LIM amounted to about 45 minutes; the drawing of past and future life-line, however, did not take more than a few minutes. The final result was a series of important life events, labeled by chronological age, for both past and future of the individual.

RESULTS

LIM data were examined in terms of the total number of life events identified by 98 subjects for both past and future. A 2 (gender) × 3 (age group) × 2 (event time: past and future) analysis of variance was conducted with repeated measures on the last factor and with the number of past and future events as the dependent variable. Overall, subjects averaged a total of 7.03 (SD = 2.73) events. No main effect for gender and age group was revealed. However, a main effect was found for the repeated measures variable, $F(1, 92) = 142.28$, $p < .001$; this means that the LIM can be characterized by a greater number of past (M = 4.96, SD = 2.46) than future events (M = 2.07, SD = 1.30).

The main effect for event time (i.e., past, future) was qualified by its interaction with the age group variable, $F(2, 92) = 18.4$, $p < .001$. The older the group, the greater the number of past events: M old = 6.24, SD = 2.65; M middle = 5.06, SD = 2.15; and M young = 3.76, SD = 2.03. In contrast, the younger the group, the greater the number of future events: M young 2.71, SD = 1.38; M middle = 2.00, SD = 1.11; and M old = 1.41, SD = 1.09.

Finally, a 3 × 2 analysis of variance was conducted to evaluate the effect of age and gender on the ratio of past or future events and total number of events (i.e., the sum of past and future events). A main effect of age group was found,

$F(2, 92) = 22.74$, $p < .001$. Follow-up tests were conducted to evaluate pairwise differences among the means. Using the Tukey HSD test, a significant difference between the youngest and the middle group, the youngest and oldest group, and the middle and oldest group was found. The mean ratio of past or future events and total number of events was .57 ($SD = .17$) for the youngest group, .71 ($SD = .12$) for the middle group, and .81 ($SD = .12$) for the oldest group. Briefly summarized, the results of this analysis reveal that the relation between past and future events changes systematically with age, while their sum is constant over the lifespan. Similar results have been found for the TL (deVries & Watt, 1996, p. 86).

In Figure 1, the summarized results of LIM and TL are reproduced graphically (i.e., the ratio of past or future events and total number of events [percent] by age group [young, middle, old]). The ratio percentages could be connected and extended by an imaginary line for both younger and older age groups. The resulting curve, which is not shown in the figure, would then suggest the changing relationship of past and future events over the course of life.

From a comparative point of view and following the Rubin et al. (1998) standardization procedure, LIM and TL data can be reproduced graphically in a different way. The top panel of Figure 2 presents the distribution of past and future events (percents) for younger adults by decade for both LIM and TL. The transition from past events to future events, symbolized by the interruption in the two curves, is indicated by the mean age of the youngest age groups ($M = 23.5$ yrs for LIM Young; $M = 21.2$ yrs for TL Young). The middle panel of Figure 2 presents the distribution of past and future events (percents) for the middle-aged group by decade for both LIM and TL, as well as the distribution of past events (percents) for the middle-aged from the Fitzgerald Study (FS). The transition from past events to future events, symbolized by the interruption in the LIM and TL curves, is indicated by the mean age of the middle-aged groups ($M = 43.3$ yrs for LIM Middle; $M = 41.9$ yrs for TL Middle). The distribution of past events for the middle-aged group of FS ends at the age of 45 years (Median = 36 yrs). Finally, the bottom panel of Figure 2 presents the bimodal distributions of past and future events (LIM and TL) and past events (FS) for the oldest groups ($M = 67.3$ yrs for LIM Old; $M = 72.7$ yrs for TL Old; Median = 66 yrs for FS Old).

Figure 2 demonstrates several memory effects. First, the distribution of future events for the three age-groups of LIM and TL follows roughly a power function (i.e., life events which are expected for the near future are mentioned more often than events which are foreseen in the distant future). By analogy with the recency effect for past events, we would christen the distribution of future events with the term *proximity* effect. Second, the distribution of past events for the three age-groups shows a variable pattern. The young adult group (top panel) follows in almost all respects the classical forgetting or retention curve with a clear recency effect (i.e., recent life events are mentioned more frequently than events experienced in the distant past). The distribution of past events for middle-aged adults (middle panel) is less clear, the expected recency effect seems to be missing and

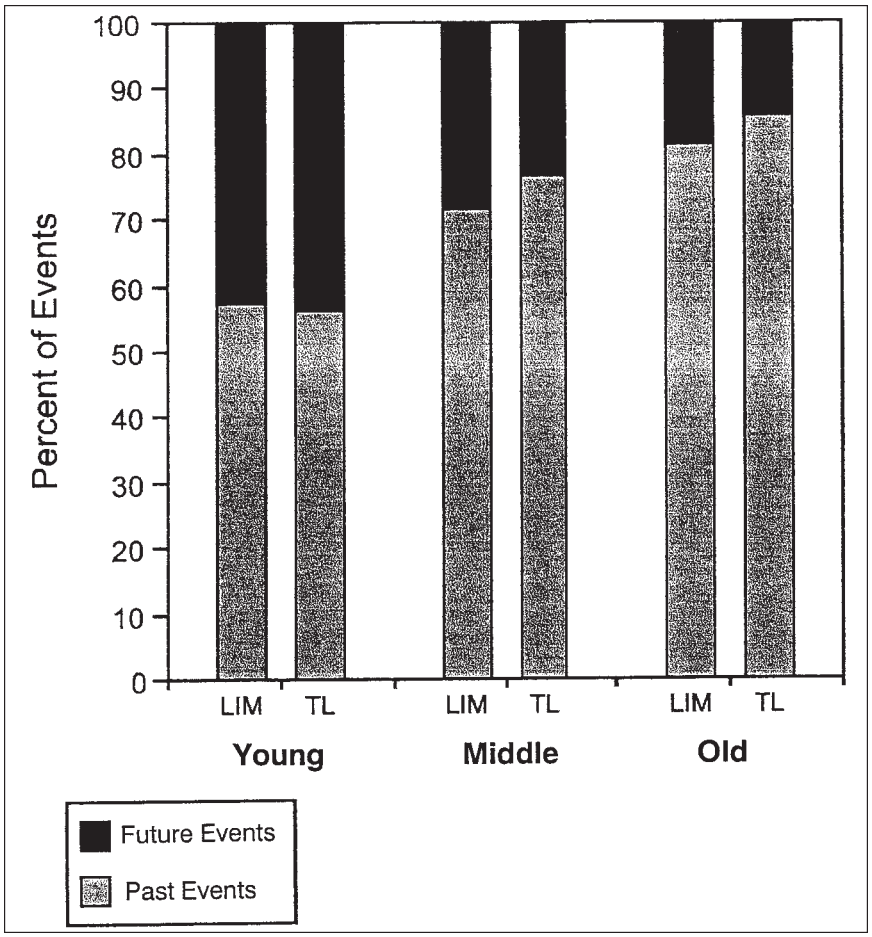

Figure 1. Ratio of past and future events (percents) for LIM (Life-line Interview Method) and TL (Time Line) by age group (young, middle, old). TL data from deVries and Watt (1996).

the peak in the LIM, TL, and FS distributions suggests an emerging bump. Finally, the distinct bimodal pattern of past events for older adults (bottom panel) demonstrates both a (light) recency effect and a (strong) bump effect for all three measures (i.e., LIM, TL, FS).

Rubin (personal communication) has noted that in standardized event distributions of age groups with significant age ranges (i.e., 12, 24, and 28 years on the LIM for young, middle, and older age groups, respectively) the mean age per age group might lead to confounding of memory effects. For a detailed

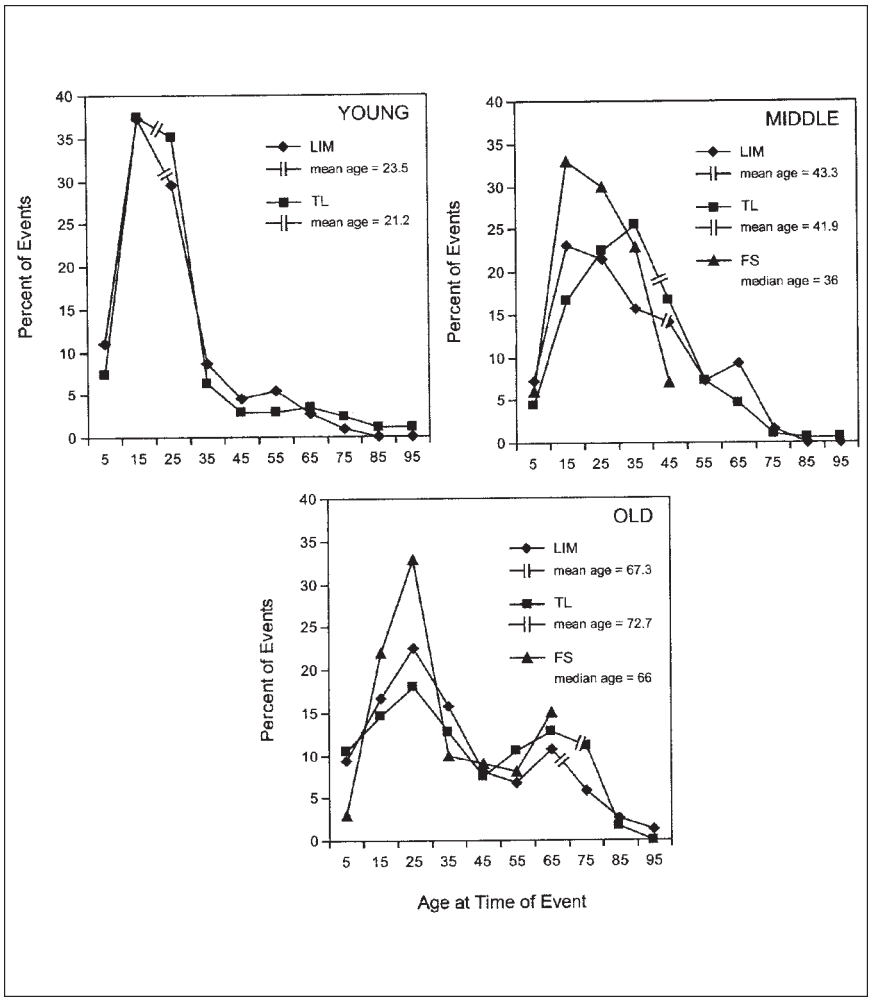

Figure 2. Top left panel: Distribution of past and future events (percents) for younger adults by decade for LIM (Life-line Interview Method) and TL (Time Line) as a function of reported age at the time of the event. Top right panel: Distribution of past and future events (percents) for the middle-aged group by decade for both LIM and TL, as well as the distribution of past events (percents) for the middle-aged from the Fitzgerald Study (FS), as a function of reported age at the time of event. Bottom panel: Bimodal distributions (percents) of past and future events (LIM and TL) and past events (FS) for older adults by decade as a function of reported age at the time of event. TL and FS data from deVries and Watt (1996) and Fitzgerald (1995), repsectively. The graphic symbol for the mean age of LIM and TL age groups refers to the transition from past to future events.

analysis of event patterns, time of testing and event time in years from time of testing should be used instead of the subject's calendar age and reported age of event. In Figure 3, the LIM distributions of past and future events (percents), scaled per three years and centered on the time of testing (0 yrs) with past (–) and future (+) event time measured in years from time of testing, are reproduced graphically for the young (top panel), middle-aged (middle panel), and old (bottom panel) age groups.

The graphical results of the post hoc analysis of LIM distributions confirm the memory effects as demonstrated in Figure 2 (i.e., strong recency and proximity effects for young adults, clear bump, recency, and proximity effects for older adults. The post hoc analysis of the LIM middle-aged distribution of past and future events shows, in addition to a clear proximity effect, a distinct bump pattern with a weak recency effect.

Briefly summarized, the graphical results of the standardized comparison show clearly that the LIM, TL, and FS curves follow the same pattern for all age groups: (a) a unimodal pattern for young and middle-aged adults, and (b) a bimodal pattern for older adults.

DISCUSSION AND CONCLUSION

In the foregoing, we presented retrospective and prospective autobiographical memory data from a lifespan perspective. In the following, we discuss these data in the light of existing and new evidence for various memory effects. In concluding the discussion, we explore a more dynamic approach to theory formation in autobiographical memory.

Retrospective Autobiographical Memory

The distribution of past events for the *oldest* age groups of LIM, TL, and FS confirms the bimodal pattern of bump and recency effects as found by Rubin et al. (1998) in quite a few autobiographical and semantic memory studies. As such, the autobiographical memory pattern of older people shows almost universal validity, which at the very worst can be discussed in terms of the age range of the bump effect (i.e., from 10 to 30 years as found by Rubin et al., from 10 to 40 years as observed for the oldest LIM, TL, and FS groups). Presumably, the age range of the bump effect depends on the type of memory measure used (e.g., LIM, TL, or FS) and on the age range of older age groups. As far as the bump effect in the oldest LIM group concerns, this study can be conceived as a successful replication of the Rubin et al. study.

As expected on the basis of classical retention studies (cf. Rubin, 1986), the distribution of past events for the *youngest* age groups of LIM and TL shows the well-known unimodal pattern of recent life events mentioned more frequently than events experienced in the distant past. The distribution of past events for the

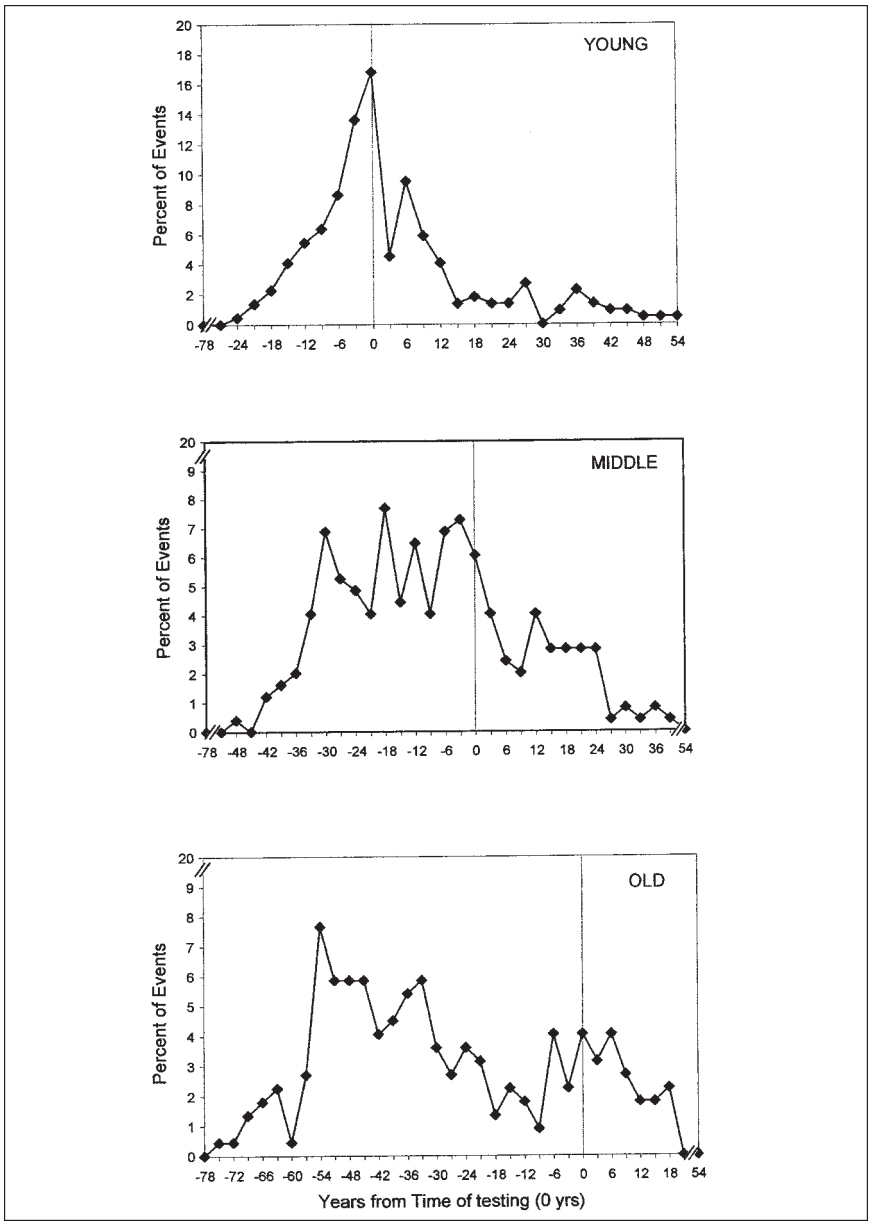

Figure 3. Distribution of past and future events (percents) for younger adults (top panel), middle-aged adults (middle panel), and older adults (bottom panel) per three years for the LIM (Life-line Interview Method) centered in years from time of testing (0 yrs).

middle-aged groups, however, poses a problem. From the classical retention perspective, the expected recency effect is missing, while by contrast a clear bump is emerging for both LIM, TL, and FS. Post hoc interpretation of the LIM data set (TL and FS data were not available) provides a possible solution of this problem, (i.e., a weak recency effect for middle-aged adults next to the emerging bump). This modest finding, however, raises the question of what happened with the bump in the youngest age groups. Fitzgerald (1995) suggested that "the autobiographical bump or increase in memories in younger adults could be overshadowed by memories for recent events" (p. 371). Turning it around, you might say that for middle-aged adults the recency effect could be overshadowed by the emergence of the autobiographical bump. If Fitzgerald's suggestion has any empirical significance and our lifespan data point in that direction, then it might be hypothesized that both bump and recency effects play a part not only in middle-aged and older adults but also in younger people. For this reason, an explanation of the autobiographical bump should be looked for in the theoretical framework of ontogenetic or lifespan psychology (Bluck & Habermas, 2001; Schroots & Yates, 1999), rather than in age-graded cognitive accounts, even though the two theoretical perspectives are not mutually exclusive.

Prospective Autobiographical Memory

According to Ellis (1996), as quoted in Maylor et al. (2002), prospective memory tasks can be divided into at least four phases, "(a) the formation or encoding of an intention, (b) the retention interval, (c) execution of an intention, and (d) the evaluation of the outcome" (p. 236). Following this division, prospective autobiographical memory can be conceived as a subset of prospective memory with the focus on the formation or encoding of expectations, anticipations, etc. To this another memory function should be added concerned with the *retrieval* of expectations of the individual about what he or she thinks will happen in the future. These expectations or anticipations, labeled as future events in this study, are stored in prospective autobiographical memory, and after prompting, their distribution follows a power function by age group; that is, life events which are expected for the near future, are mentioned more frequently than events which are expected for the distant future. Before, we have named this distributional characteristic of prospective autobiographical memory with the term *proximity* effect, after the term recency effect as used in episodic memory studies. By analogy with the classical retention function of past events, we now would like to introduce the term *projection* function as a new name for the distribution of future events. For the moment, we believe that the projection function reflects the varying degrees of individual confidence by which expected future events will become reality with the passage of time and subsequently turn into past events. This assumption would explain the outlier at the age of 65 years in the LIM middle-age distribution of future events (Figure 2, middle panel) (i.e.,

middle-aged people of Dutch origin feel relatively confident that they will retire at the age of 65, because of the long-standing mandatory retirement policy in The Netherlands).

Autobiographical Memory from a Lifespan Perspective

A significant outcome from a lifespan perspective is the finding that the overall number of events proved not to differ by age for both LIM and TL; that is, the sum of past and future events is constant across age groups for two different memory measures. In this respect, deVries and Watt (1996) referred to Martin and Smyer (1990), who reported similar results for a life event sorting task used in a comparative cohort study of autobiographical memory:

> The cohort comparison in regard to the number of life events was surprising. One would have expected a notable difference between the number of recognized life events from the older cohorts when compared to the college cohort. The difference, however, was not significant (p. 305).

Given similar results for three independent studies (i.e., deVries & Watt, 1996; Martin & Smyer, 1990; this study) and three different methods (i.e., LIM, TL, life event sorting task), one might conclude with a quotation from deVries and Watt (1996) that "it is as if there exists a sort of finite capacity for the identification and representation of the events of a life" (p. 95). Earlier, Schroots and Assink (1998) expressed the relative capacity of autobiographical memory in the so-called *Principle of the Constant Life Perspective* (i.e., the sum of past and future autobiographical events is constant across the lifespan). This principle, illustrated in Figure 1, refers basically to the changing ratio of past or future events and the sum of past and future events over the course of life during which young adults, in comparison with middle-aged and older adults, nourish relatively more expectations (e.g., future events) than memories (e.g., past events), and conversely, older adults nourish more memories than expectations, while the sum of their memories and expectations is constant over the lifespan. In all probability, the changing ratio with age follows a power curve in which there is a limit to growth or decline (i.e., the S-shaped, logistic growth/decline curve) (van Geert, 1994).

Autobiographical Memory from a Dynamical Perspective

Recently, Rubin (2002) finished a review chapter on "Autobiographical memory across the lifespan" with a short autobiographical story titled "Phenomenon-Centered Research." His story began and ended as follows:

> I gave this chapter a semihistorical presentation partly because it reports on a program of research that I and my collaborators stumbled into, one

> observation at a time, without a strong theory to guide us. I wanted to portray a research program that is less common than the hypothetical-deductive one favoured for the final reporting of research in most journals and required for the planning of research in grant proposals. Though less favored, I believe that it is one approach that needs to be used if science is to advance in an efficient manner. (. . .) The strength of the (phenomenon-centered) approach used here is that it documents and notes the limits of a robust phemonenon. The weakness is that a theoretical account of the data is not as easy to obtain as it is when all experiments are derived from a single theory (pp. 178-179).

From the presentation of our data, it is plain that we have followed a mainly phenomenon-centered approach. In this last section, we make an attempt to mark the contours of a theory-driven approach, bearing in mind the words of Lewin (1951) that there is nothing so practical as a good theory. A theoretical framework helps the scientist to accumulate and integrate data into a body of knowledge, as well as to provide directions for new research.

In the foregoing, a theoretical outline was suggested for the study of autobiographical memory as a dynamic system of both retrospective and prospective memory subject to continuous changes across the lifespan. The philosopher Whitehead (1929) expressed some basic thoughts about the dynamic relation of past and future events. His central insight is that reality is constantly being created. We live in a world that consists of individual temporal occasions, becoming and perishing. Whitehead's basic unit, the *actual occasion* or life event, is a happening in time with a beginning, a middle, and an end. It involves a progression from potentiality to actuality and from future to past. What is past belongs to the world of actual entities (e.g., past events, memories), whereas what is in the future belongs to the world of possibilities (e.g., future events, expectations). At each present moment, the transfer from one world to the other takes place, and the process is irreversible (i.e., time flows in one direction only). Metaphorically speaking, individual life consists of a *flow of events* progressing from potentiality to actuality.

Whitehead's philosophical ideas lend themselves very well for the development of a more dynamic theory of autobiographical memory. From a static perspective, autobiographical memory consists of two modules: (a) a prospective and (b) a retrospective memory module. Prospective memory includes all future events or expectations of the individual; retrospective memory, on the other hand, stores all past events or memories. Autobiographical memory, however, is not a static but a dynamic system subject to continuous changes. From a dynamical perspective, then, autobiographical memory consists of a flow of events which undergo a change of state over the course of time from future event (expectation) to past event (memory). According to the Principle of the Constant Life Perspective, the sum of past and future events is constant across the lifespan, whereas the ratio of past or future events and their sum changes with age. From the perspective of a *dynamic prototheory of autobiographical memory,* then, this means that the

relative number of future events or expectations decreases with age, whereas the relative number of memories increases over time. In the final analysis and based on this prototheory, a lifespan model needs to be developed, which represents the dynamics of autobiographical memory across the lifespan. At present, the construction and validation of such a model, provisionally called *Janus* after the Roman god with two faces, one face looking into the future and one into the past, is well under way.

REFERENCES

Bluck, S., & Habermas, T. (2001). Extending the study of autobiographical memory: Thinking back about life across the life span. *Review of General Psychology, 5,* 135-147.

Brewer, W. F. (1995). What is recollective memory? In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 19-66). Cambridge, UK: Cambridge University Press.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107,* 261-288.

Crovitz, H. F., & Schiffman, H. (1974). Frequency of episodic memories as a function of their age. *Bulletin of the Psychonomic Society, 4,* 517-518.

deVries, B., & Watt, D. (1996). A lifetime of events: Age and gender variations in the life story. *International Journal of Aging and Human Development, 42,* 81-102.

Ellis, J. (1996). Prospective memory or the realization of delayed intentions: A conceptual framework for research. In M. Brandimonte, G. O. Einstein, & M. A. McDaniel (Eds.), *Prospective memory: Theory and applications* (pp. 1-22). Mahwah, NJ: Erlbaum.

Fitzgerald, J. M. (1995). Intersecting meanings of reminiscence in adult development and aging. In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 360-383). Cambridge, UK: Cambridge University Press.

Galton, F. (1879). Psychometric experiments. *Brain, 2,* 149-162.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: The University of Chicago Press.

Lewin, K. (1951). *Field theory in social science.* New York: Harper.

Martin, P., & Smyer, M. A. (1990). The experience of micro- and macroevents: A life-span analysis. *Research on Aging, 12,* 294-310.

Maylor, E. A., Darby, R. J., Logie, R. H., Della Sala, S., & Smith, G. (2002). Prospective memory across the lifespan. In P. Graf & N. Ohta (Eds.), *Lifespan development of human memory* (pp. 235-256). Cambridge, MA: The MIT Press.

Rappaport, H., Enrich, K., & Wilson, A. (1985). Relation between ego identity and temporal perspective. *Journal of Personality and Social Psychology, 48,* 1609-1620.

Robinson, J. A., & Taylor, L. R. (1998). Autobiographical memories and self-narratives: A tale of two stories. In C. P. Thompson, D. G. Herrmann, D. Bruce, J. Don Read, D. G. Payne, M. P. Toglia (Eds.), *Autobiographical memory: Theoretical and applied perspectives* (pp. 125-143). London: Lawrence Erlbaum Associates.

Rubin, D. C. (Ed.) (1986). *Autobiographical memory.* Cambridge, UK: Cambridge University Press.

Rubin, D. C. (2002). Autobiographical memory across the lifespan. In P. Graf & N. Ohta (Eds.), *Lifespan development of human memory* (pp. 159-184). Cambridge, MA: The MIT Press.

Rubin, D. C., Rahhal, T. A., & Poon, L. W. (1998). Things learned in early adulthood are remembered best. *Memory & Cognition, 26,* 3-19.

Rubin, D. C., & Schulkind, M. D. (1997). The distribution of autobiographical memories across the lifespan. *Memory & Cognition, 25,* 859-866.

Schroots, J. J. F. (1984). The affective consequences of technological change for older persons. In P. K. Robinson, J. Livingston, & J. E. Birren (Eds.), *Aging and technological advances* (pp. 237-247). New York: Plenum Press.

Schroots, J. J. F. (1988). On growing, formative change and aging. In J. E. Birren & V. L. Bengtson (Eds.), *Emergent theories of aging* (pp. 299-329). New York: Springer.

Schroots, J. J. F. (2003). Life-course dynamics: A research program in progress from The Netherlands. *European Psychologist, 8,* 192-199.

Schroots, J. J. F., & Assink, M. H. J. (1998). LIM/Levenslijn: Een vergelijkend structuuronderzoek (LIM/Life-line: A comparative study of structure). *Tijdschrift voor Ontwikkelingspsychologie, 24,* 1-23.

Schroots, J. J. F., Birren, J. E., & Kenyon, G. M. (1991). Metaphors and aging: An overview. In G. M. Kenyon, J. E. Birren, & J. J. F. Schroots (Eds.), *Metaphors of aging in science and the humanities* (pp. 1-16). New York: Springer.

Schroots, J. J. F., & ten Kate, C. A. (1989). Metaphors, aging and the Life-line Interview Method. In D. Unruh & G. Livings (Eds.), *Current perspectives on aging and the life cycle. Vol. 3: Personal history through the life course* (pp. 281-298). London: JAI Press.

Schroots, J. J. F., & Yates, F. E. (1999). On the dynamics of development and aging. In V. L. Bengtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 417-433). New York: Springer.

van Geert, P. (1994). *Dynamic systems of development.* New York: Harvester Wheatsheaf.

Whitehead, A. N. (1929). *Process and reality.* New York: Free Press.

Direct reprint requests to:

Johannes J. F. Schroots
Department of Psychology
Free University Amsterdam
vd Boechorststraat 1,
1081 BT Amsterdam
The Netherlands
e-mail: jjf.schroots@psy.vu.nl